

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-173118

(43)Date of publication of application : 29.06.1999

(51)Int.Cl.

F01L 1/34

(21)Application number : 09-342846

(71)Applicant : TOYOTA MOTOR CORP

(22)Date of filing : 12.12.1997

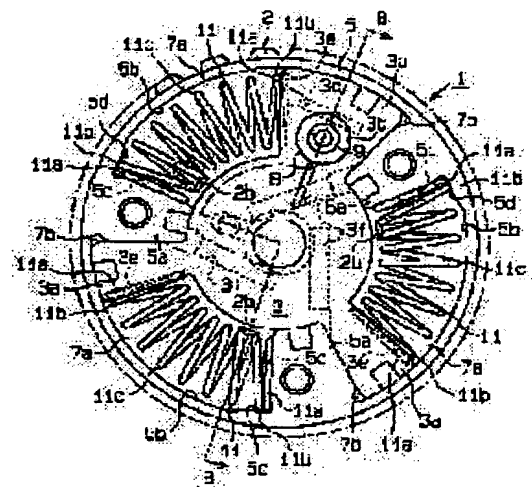
(72)Inventor : ASAKURA TAKESHI  
MORIYA YOSHITO  
SUGIMOTO ATSUSHI

## (54) VARIABLE VALVE TIMING MECHANISM OF INTERNAL COMBUSTION ENGINE

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a variable timing mechanism of an internal combustion engine to prevent the damage of the function of an energizing means when a cam shaft is rotated based on a crankshaft, in a variable valve timing for an internal combustion engine having an energizing means to energize relative rotation of a cam shaft with the crankshaft.

SOLUTION: An arc spring 11 energizes relative rotation of an internal rotor 3 with a sprocket 2. The end part 11b, having the effective number of windings, of the arc spring 11 is arranged on the outside diameter side. Thus, when the arc spring 11 is contracted, bending toward the outside diameter side of the intermediate part 11c of the arc spring 11 is suppressed. As a result, contact of the intermediate part 11c with the wall surface on the outside diameter side of a lead angle chamber 7a is suppressed.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C): 1998,2003 Japan Patent Office

BEST AVAILABLE COPY





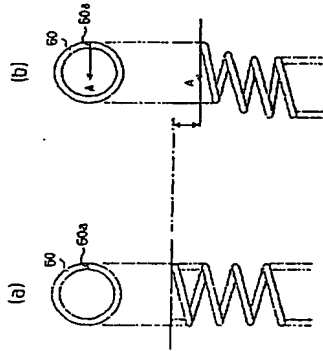




待時平11-173113

(2)

(27)



NOT AVAILABLE COPY

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**